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Suppliers' Information Note

For The Openreach Network

Optical Spectrum Access Cloud Connect™

Service & Interface Description

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1. Introduction

This Suppliers' Information Note (SIN) describes the Openreach Optical Spectrum Access Cloud Connect (OSA Cloud Connect) service and its interfaces. OSA Cloud Connect is a product within the Openreach Optical Spectrum Services portfolio. This document should be read in conjunction with the OSA product description available on the Openreach portal.

https://www.openreach.co.uk/orpg/home/products/opticalservices/opticalservices.do

2. Optical safety

OSA Cloud Connect uses class 1M laser products so care must be taken when working on or around it. IEC 60825 and British Standards Institution BS EN 60825-1:2014 refer to this.

OSA Cloud Connect equipment chassis and associated Openreach ancillary equipment should only be accessed by an authorised Openreach person or persons under their instruction. The Communications Providers' suitably qualified engineers are limited to access to the defined service demarcation points on this equipment.

Under no circumstances should any person look directly into a fibre optic cable or an optical port, as any emitted laser light can cause permanent damage to the eyes.

3. General service outline

OSA Cloud Connect is an end-to-end wavelength service between sites delivered over Openreach provided fibre infrastructure using coherent DWDM (Dense Wavelength Division Multiplexing) technology.

OSA Cloud Connect is currently offered as a Point-to-Point service only.

OSA Cloud Connect supports Filter Connect where optical filters are used. This allows a Communications Provider (CP) to directly connect to available spare ports on the passive optical filters , where fitted, on the bearer to pass traffic over the same fibre path.

The OSA Cloud Connect service has maximum radial distance limits between BT serving exchanges, and maximum fibre route distance limits between OSA Cloud Connect bearer circuit end points.

3.1 Equipment vendor

OSA Cloud Connect uses equipment from the Adva FSP3000 Cloud Connect (F8) range.

3.2 OSA Cloud Connect structure

The elements of the service are:

Bearer: this is the DWDM line system which can support a mix of wavelengths.

Optical Filter: The optical filter is an integral part of the bearer and enables several different wavelength channels to share the same network fibre path. A filterless bearer option is available supporting a single managed wavelength only. The filterless option does not support Filter Connect use.

End-point amplification: Depending on the configuration of the service and the length of the fibre route, end-point amplification may be required to ensure the OSA Cloud Connect bearer system works effectively. Note that amplification options are currently not available.

Managed Wavelengths: these are ordered separately from the bearer and are specific to the protocol and speeds required. They are installed in the OSA Cloud Connect bearer.

3.3 Circuit protection

Two levels of bearer circuit protection are available:

- Standard
- Resilience Option 2

Wavelength switching protection is not available.

Refer to the OSA product description for further information on bearer resilience options and wavelengtprotection https://www.openreach.co.uk/cpportal/home

3.4 Service availability

OSA Cloud Connect is available when the product can pass traffic in both directions across any of managed service boundaries.

3.5 Geographical availability

The Openreach OSA Cloud Connect service is offered throughout the United Kingdom subject to survey.

4. Managed wavelengths

The maximum number of managed wavelengths currently supported by OSA Cloud Connect service is 8; the minimum is one.

4.1 Customer Interface

OSA Cloud Connect managed wavelengths are intended for connection to standard optical interfaces of 850 nm multimode or 1310 nm single-mode types. No electrical interfaces are offered.

Client interfaces are presented via an Openreach optical patch panel using dual LC interfaces. The 100G SR4, 40GE SR4, FC32G, and 25GE SR4 interface is a Multi-fibre Push-On (MPO) type connector presented on an Openreach patch panel.

The CP is responsible for providing, connecting and maintaining suitable optical cables to connect to these interfaces. Either a single duplex or a pair of simplex LC cables may be used to connect to the client interface where appropriate, though duplex cables with dual LC connectors will ensure that transmit and receive connections are correctly made the right way round.

Note that the fibre cabling between the managed wavelength service card and the Openreach patch panel is part of the OSA Cloud Connect service and may only be accessed by Openreach engineers or their agents. Direct connection of customer cables to the managed wavelength service card is not permitted.

The patch panel interface, where used, is the Network Termination Point (NTP), i.e. the point of connection between the Openreach service and the CPE interface.

Service	Card type	Client Port Options
100GE	200G Flexponder (Openfab+)	QSFP28/112G/SR4/MM/MPO
100GE	200G Flexponder (Openfab+)	QSFP28/112G/LR4/SM/LC
100GE	400G Muxponder (QuadFlex)	QSFP28/112G/SR4/MM/MPO
100GE	400G Muxponder (QuadFlex)	QSFP28/112G/LR4/SM/LC
OTU4	200G Flexponder (Openfab+)	QSFP28/112G/LR4/SM/LC
OTU4	400G Muxponder (QuadFlex)	QSFP28/112G/LR4/SM/LC
40GbE	200G Flexponder (Openfab+)	QSFP14/56G/SR4/MM/MPO
40GbE	200G Flexponder (Openfab+)	QSFP10/43G/LR4/SM/LC
25GbE	200G Flexponder (Openfab+)	QSFP28/112G/SR4/MM/MPO
10GbE	200G Flexponder (Openfab+)	QSFP10/43G/SR4/MM/MPO
10GbE	200G Flexponder (Openfab+)	QSFP10/11G/4LR/SM/MPO
OTU2	200G Flexponder (Openfab+)	QSFP10/43G/SR4/MM/MPO
OTU2	200G Flexponder (Openfab+)	QSFP10/11G/4LR/SM/MPO
OTU2e	200G Flexponder (Openfab+)	QSFP10/43G/SR4/MM/MPO
OTU2e	200G Flexponder (Openfab+)	QSFP10/11G/4LR/SM/MPO
FC32G	200G Flexponder (Openfab+)	QSFP28/112G/SR4/MM/MPO
FC16G	200G Flexponder (Openfab+)	QSFP14/56G/SR4/MM/MPO

FC8G	200G Flexponder (Openfab+)	QSFP10/43G/SR4/MM/MPO
FC8G	200G Flexponder (Openfab+)	QSFP10/11G/4LR/SM/MPO
STM64	200G Flexponder (Openfab+)	QSFP10/43G/SR4/MM/MPO
STM64	200G Flexponder (Openfab+)	QSFP10/11G/4LR/SM/MPO

Table 1: Client Power Parameters

4.2 Transparency and Error propagation

The OSA Cloud Connect service is designed to provide a reasonable level of transparency. PCS layer transparency allows not only Ethernet bytes to be transported, but also the IFG (also known as IPG) to be transported. Physical layer transparency description in the Table 1 is used to indicate that transport is at the binary level. As transport of Ethernet occurs below layer 2, (at line code / PCS level or physical layer), layer 2 Ethernet control protocols are transported transparently.

Transport of Ethernet frame sizes greater than 9600 bytes, is not supported.

In the event of a failure of a client input at one end of the link, an error signal will be propagated to the far end client port. In the event of a wavelength / bearer failure, an error signal will be generated on the NTE's client port at both ends of a link. In most cases this error propagation signal will be an International Standards defined error signal for some cards, for other cards this will be a laser off / Loss of Signal condition.

It is strongly advised that interconnecting equipment with Loss of Signal error propagation behaviour is avoided as this scenario will greatly complicate the re-establishment of end-to-end connectivity.

4.3 Client optical power margins for both receive and transmit interfaces

The table below shows details of the Optical power margins for both the Receive and Transmit interfaces of the client facing optical interfaces. Please note that the CP may be responsible for damage caused by exceeding the optical parameters listed.

Customer interface type	Valid Input Range	Expected Output from interface
QSFP10/11G/4LR/SM/MPO	-13.4dBm to -0.5dBm (per lane)	-8.2dBm to +0.5dBm (per lane)
QSFP10/43G/SR4/MM/MPO	-9.0dBm to +1.4dBm (per lane)	-7.3dBm to +2.4dBm (per lane)
QSFP10/43G/LR4/SM/LC	-12.5dBm to +1.3dBm (per lane)	-7.0dBm to +2.3dBm (per lane)
QSFP14/56G/SR4/MM/MPO	-8.5dBm to +1.4dBm (per lane)	-7.3dBm to +2.4dBm (per lane)
QSFP28/112G/LR4/SM/LC	-9.6dBm to 3.5dBm (per lane)	-4.3dBm to 4.5dBm (per lane)
QSFP28/112G/SR4/MM/MPO	-9.3dBm to 1.4dBm (per lane)	-8.4dBm to 2.4dBm (per lane)

Table 2: Client Power Parameters

SM = Single-mode fibre connection; MM = Multimode fibre connection; LC = Lucent Connector; MPO = Multi-fibre push on connector

5. Filter Connect

Depending on the bearer configuration, OSA Cloud Connect supports Filter Connect. This allows CPs to create and manage their coherent WDM optical services (alien wavelengths) via spare ports on the optical filter. Please note that sub-10Gbit/s and 10Gbit/s alien wavelengths should not be used.

Openreach will maintain a minimum of one managed wavelength per OSA Cloud Connect bearer and then all other filter ports are available for CP use as required. CPs can also choose to have multiple Openreach managed wavelengths on the service.

Openreach retain ownership of the OSA Cloud Connect equipment, filters and fibre. Set up and maintenance of CP services, including optical patch cabling, over the own-use Filter Connect ports is the CP's responsibility.

5.1 Customer interface

The customer interface and service demarcation point for CP provided 'alien' wavelengths on OSA Cloud Connect is on the optical filter ports. These are dual LC. Either a single duplex or a pair of simplex LC cables may be used where appropriate, though duplex cables with dual LC connectors will ensure that transmit and receive connections are correctly made the right way round.

5.2 Filter port allocation guidance

Openreach managed wavelengths will connect from the lowest channel number on the filter working upwards towards the highest channel number. It is recommended that the CP connects their wavelengths from the highest channel number on the filter and works downwards towards the lowest channel number.

5.3 Channel Isolation

The channel isolation specification for all filter types is given below:

Adjacent Channel Isolation (dB)	30
Non-Adjacent DWDM Channel Isolation (dB)	30

Table 3: OSA Cloud Connect Filter Isolation

5.4 Optical safety Limits

The maximum CP Tx output power launched into the optical filter shall be no more than +4dBm for any filter configuration. This is to ensure that the solution remains compliant with class 1M from IEC 60825-2 (Safety of Optical Fibre Communications Systems) after the WDM signals are combined by the optical filter. It is the CPs responsibility to ensure that light levels for each optical channel do not exceed this figure.

5.5 Commissioning alien wavelengths on Filter Connect

Equalisation is required when additional wavelengths are added to amplified Filter Connect systems. This involves inserting the appropriate sizes of pad between:

- Filter Connect and the Tx
- Filter Connect and the Rx.

CPs can perform their own equalization but note that a device capable of measuring per channel powers in the presence of out of band noise is required.

Equalization is not required for unamplified Filter Connect systems.

The following optical measurements will be shared via the customer handover pack following the commissioning of an OSA Cloud Connect bearer to enable customer network planning over the OSA Cloud Connect infrastructure.

- Per site / bearer details
- Per channel, end-to-end loss for non-amplified bearers
- Total fibre route distance

6. Network parameters

The first column in the tables below refers to port labelling on the filter card.

Note, any deviation for the centre frequency from CP equipment should be no more than +/- 0.25nm from the equivalent wavelength for the centre frequency specified on a filter card, for example a deviation of +/- 0.38nm is expected to incur an additional loss of 1dB. The frequency/wavelength allocations are as follows:

6.1 Frequency plan: 8CSM+ 200GHz (Dual Fibre Working)

The following plan refers to 8CSM+#19430-#19290.

A-end and B-end Port number	Centre Frequency (THz)	Equivalent Wavelength (nm)
C1	194.30	1542.94
C2	194.10	1544.53
C3	193.90	1546.12
C4	193.70	1547.72
C5	193.50	1549.31
C6	193.30	1550.91
C7	193.10	1552.52
C8	192.90	1554.13

Table 4: 8CSM+ frequency plan

6.3 Channel isolation

The channel isolation specification for each filter type is given below:

Filter type	Single Fibre/Dual Fibre Working	Adjacent isolation (dB)
8CSM+ 200GHz	DFW	30

Table 5: Channel isolation

6.4 Optical safety limits

The maximum output power for any CP optical channel, shall be no more than +4dBm for any filter configuration. It is the CPs responsibility to ensure that light levels for each optical channel do not exceed this figure.

6.5 Recommended optical power levels for non-amplified links

Acceptable light level range for each channel into OSA Cloud Connect filter – standard reach: -1dBm to +4dBm

6.6 Minimum optical receiver sensitivity for CP equipment

-22dBm as the low threshold for OSNR>30dB (0.1nm). This limit is applicable for non-amplified links

6.7 Chromatic Dispersion

OSA Cloud Connect is optimised for coherent optical transport only and as such does not provide any dispersion compensation.

6.8 Maximum Reach for Point-to-Point applications

The fibre type used to deliver the reaches below is G.652, with maximum fibre loss assumed to be 0.35dB/km. This includes the loss of any patch panels and fusion splices used by Openreach, fibre ageing and repair margin.

The CP is responsible for ensuring that Transmit (Tx) and Receive (Rx) are compatible and are able to meet the specifications quoted on the request form. The CP is also responsible for alien WDM compatibility to achieve the coherent WDM specifications summarized in the reach tables below. This is especially important in the transverse compatibility interoperation case where the WDM combination is less likely to have been tested by systems vendors.

Mixed 10Gbit/s & 100Gbit/s coherent wavelengths are not supported on OSA Cloud Connect.

Amplification options are not currently available.

200Gbit/s coherent (Dual Fibre Working)		
Filter option	OSA Cloud Connect 400G Muxponder Km*	OSA Cloud Connect 200G Flexponder Km*
Filterless	68	50
8-channels (8CSM+ 200GHz)	57	39
17 channels (8CSM+ 200GHz and 9CSM+)	43	25

The 9CSM+ filter is a planned development. Route distances for 17-channels are shown for information purposes only.

Table 6: Maximum reach (km) – unamplified 200Gbit/s coherent (Dual Fibre Working)

6.9 Optical interworking

It is the CPs responsibility to ensure optical signal compatibility between equipment used on either side of the OSA Cloud Connect bearer, particularly if different equipment vendors are used at the a-end and b-end. Where alien wavelengths are deployed using coherent modulation technology, CPs are strongly advised to confirm with their system vendors that the wavelengths used are safe to use with Filter Connect.

7. Fibre

Where a service employing a local or remote single-mode interface is provided, all fibre optic connections to and from the patch panel use single-mode fibre 9/125 micron according to ITU-T G.652.

Where a service employing a multimode interface is provided all fibre optic connections to and from the patch panel use multimode fibre OM3 or OM4.

8. Equipment specifics

OSA Cloud Connect is suitable for installation in locations that meet the environmental, power and safety requirements of the OSA Cloud Connect chassis and supporting equipment.

Chassis Type	Operating Temperature	Relative Humidity	Dimensions	Weight
1U (2-slot)	+5°C to +40°C	Max 85% at 40°C (non-condensing)	447mm (W) x 585mm (D) x 44.5mm (H)	8.8 kg
3U (4-slot)	+5°C to +40°C	Max 85% at 40°C (non-condensing)	443mm (W) x 295mm (D) x 44.5mm (H)	12 kg

Table 7: Environmental

There are two chassis types available in either AC or DC power, these are detailed in the table below. For all chassis types and power options Openreach requires the following additional power supplies:

- A 240V AC supply using a 13A switched socket to power the remote network management system. The socket must be within 1.5m of that equipment.
- A 240V AC power supply to power Openreach test equipment during both initial commissioning and subsequent maintenance support activities. This socket must be within 1.5m of the chassis.

It is the customer's responsibility to provide and maintain the power supply for the OSA Cloud Connect service. The rack where the OSA Cloud Connect service will be installed must be grounded with a clean earth supply. Further information on installation and power requirements is available from the OSA Cloud Connect product description.

Chassis Type	Chassis height*	Mounting	AC power	DC power	Typical power consumption	Max. power consumption
1U (2-slot)	1U	Non ETSI	Dual. Rear. Hot-swap	Dual. Rear. Hot-swap	360W (DC) 360W (AC)	522W (DC) 539W (AC)
3U (4-slot)	3U	ETSI compliant	Dual. Front. Hot-swap	Dual. Front. Hot-swap	720W (DC) 720W (AC)	1015W (DC) 1015W (AC)

Table 8: Chassis options

*** Excludes filters, signal correction equipment, fibre trays.**

Chassis Type	Power	Power feeds per chassis	Fuse per power feed (Amps)	Power Cable Termination
1U (2-slot)	AC	2	10A	Supplied AC power cables are 2.5m long and have a standard 13A plug (BS1363) fitted with a 10 Amp fuse for connection to the AC supply

				and an IEC60320 type C19 for connection to the NTE.
1U (2-slot)	DC	2	20A	Cable termination.
3U (4-slot)	AC	2	10A	Supplied UK plug with 10A fuse, 2.5m length and an IEC60320 type C19 for connection to the NTE.
3U (4-slot)	DC	2	32A	Cable termination.

Table 9: Power requirements

9. Further Information

For enquiries concerning connection availability between particular sites and for further product information about this service please visit the website at www.openreach.co.uk or contact your Openreach Sales & Relationship Manager or sales specialist.

If you have enquiries relating to this document then please contact: orsinsfa@openreach.co.uk

10. References

ITU-T G.651	Recommendation G.651 (02/98) - Characteristics of a 50/125 μm multimode graded index optical fibre cable
ITU-T G.652	Recommendation G.652 (04/97) - Characteristics of a single-mode optical fibre cable
Fast Ethernet	IEEE 802.3
Gigabit Ethernet	IEE 802.3z or SIN 360 Gigabit Ethernet for the BT Network
IEC 61754-7	Standard for "Fibre Optic Interconnecting Devices & Passive Components – Fibre Optic Connector Interfaces – Part 7: Type MPO Connector Family"
ETSI	European Telecommunications Standards Institute
ITU-T G.8261	Recommendation ITU-T G.8261/Y.1361 - Timing and synchronization aspects in packet networks networks
ITU-T G.8262	Recommendation ITU-T G.8262/Y.1362 - Timing characteristics of synchronous Ethernet equipment slave clock
ITU-T G.8264	Recommendation ITU-T G.8264/Y.1364 - Distribution of timing information through packet networks
IEEE 1588v2	IEEE standard 1588™-2008 - IEEE Standard for a Precision Clock Synchronization Protocol for Networked Measurement and Control Systems Networked Measurement and Control Systems
ITU-T G.8273.2	Recommendation ITU-T G.8273.2/Y.1368.2 - Timing characteristics of telecom boundary clocks and telecom time slave clocks
ITU-T G.8275.1	Recommendation ITU-T G.8275.1/Y.1369.1 - Precision time protocol telecom profile for phase/time synchronization with full timing support from the network
IEEE 802.1q	IEEE Standard 802.1Q™-2014 - Bridges and Bridged Networks
ITU-T G.8265.1	Recommendation ITU-T G.8265.1/Y.1365.1- Precision time protocol telecom profile for frequency synchronization
IEEE 802.1q	IEEE Standard 802.1Q™-2014 - Bridges and Bridged Networks

Please see information available at: https://www.openreach.co.uk/orpg/home/helpandsupport/sins/sins.do regarding the availability of Openreach published standards.

11. Abbreviations

CP	Communications Provider
CPE	Customer Premises Equipment
DWDM	Dense Wavelength Division Multiplexing
Gbit/s	Gigabits per second
IEC	International Electrotechnical Commission
ITU-T	International Telecommunication Union- Telecommunications standardization Sector
km	Kilometre
LC	Lucent Connector
LAN	Local Area Network
MM	MultiMode
MPO	Multi-fibre Push On
nm	nanometre
NTE	Network Terminating Equipment
NTP	Network Terminating Point
OSA	Optical Spectrum Access
OSNR	Optical signal-to-noise ratio
PHY	Physical Layer
Rx	Receive
SC	Subscription Channel
SIN	Supplier Information Note
SM	Single Mode
Tx	Transmit
WDM	Wavelength Division Multiplexing

12. History

Issue	Date	Changes
1.0	17 April 2023	
1.0	February 2025	Bi-annual review – no changes made – issue number therefore remains the same

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